TECHNOLOGY DEPT.

Midwest Engineer

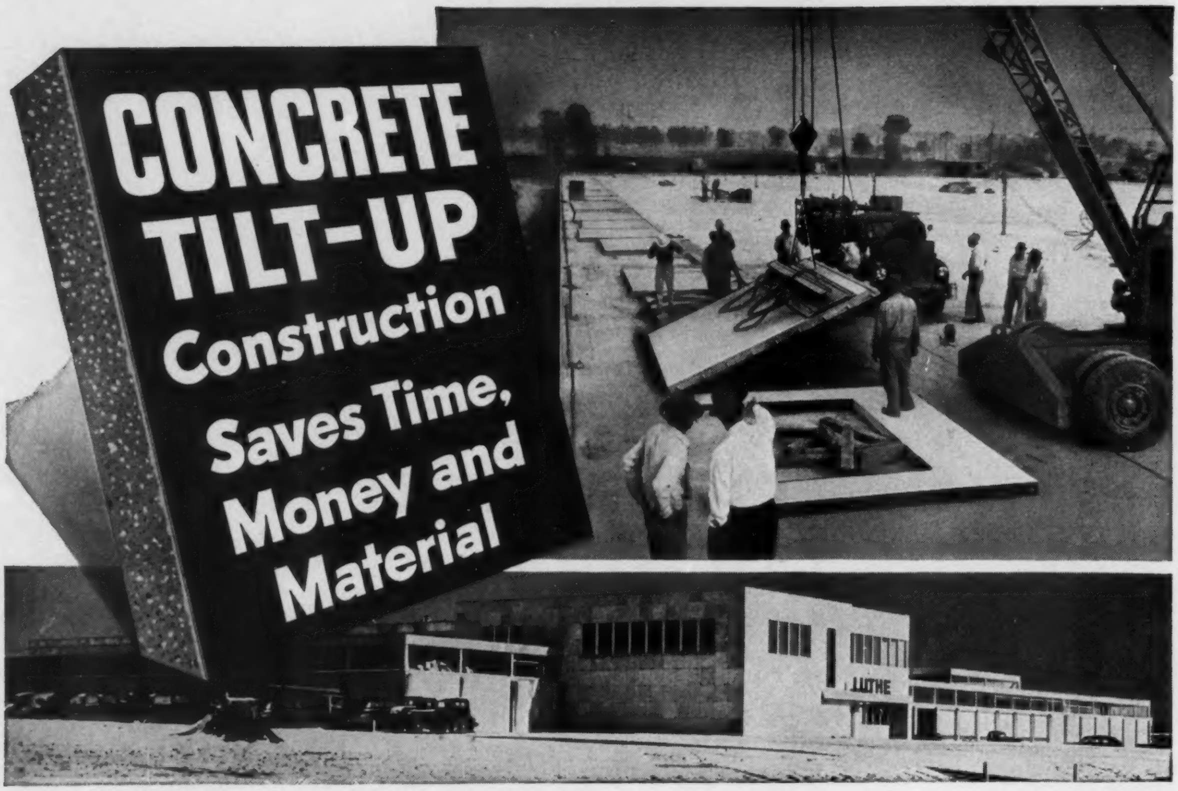
PUBLIC LIBRARY AUG 1952 DETROIT

SERVING THE ENGINEERING PROFESSION

WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

TRAFFIC ENGINEERING DESIGN
OF DIAL TELEPHONE EXCHANGES—PAGE THREE

Vol. 4 MAY, 1952 No. 9



TILT-UP, the fast, modern and economical method of concrete construction was used in building the Luthe Hardware Company warehouse in Des Moines, Iowa—a structure with more than two acres of floor space.

Tilt-up construction is adaptable to individually designed or standard buildings and is practical for one-story or multi-story structures. It is quick and easy and reduces form building and form handling to a minimum.

Wall panels are cast flat in simple edge forms—usually right on the concrete floor—and then tilted up into position with power cranes or hoists. Panels can be sized to meet a wide variety of requirements. Cast-in-place piers and beams tie the panels together into one integrated unit.

Structures built by the tilt-up method have all the desirable properties of any concrete building. They are firesafe, decay-proof, trim and neat in appearance. Their first cost is moderate, they last a lifetime and cost little to maintain. They are truly ***low-annual-cost*** construction.

Learn more about this time-saving, economical method. Write today for free technical bulletins, containing design and construction details. Distributed only in the United States and Canada.

•

The new Luthe Hardware Company concrete warehouse in Des Moines is a 240 x 420 ft. structure with a two-story, 45 x 75 ft. office wing. Tilt-up construction was used throughout, except for the office wing projection, which is cast stone.

Tilt-up panels are 11 ft. high, 13 ft. 8 in. long and 6 in. thick. Only seven sets of edge forms were used to build 73 wall panels.

Engineering and construction work by The Weitz Company, Inc.; Brooks-Borg, architects of Des Moines, consultants on architectural design.

Upper photo shows 5½-ton wall section being tilted into position. Lower photo is a view of the completed building.

PORTLAND CEMENT ASSOCIATION

33 W. Grand Avenue, Chicago 10, Ill.

A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

Now Available . . .

SOUND FILM ON TILT-UP CONSTRUCTION

Our new 16 mm. sound film on tilt-up construction is available for showing at group meetings of architects, engineers or contractors. Requests should be made at least three weeks before date of meeting.

MIDWEST ENGINEER
Published Monthly
BY
THE WESTERN
SOCIETY OF ENGINEERS
AT
2207 DODGE AVENUE
EVANSTON, ILLINOIS

•

Donald N. Becker............................*President*
Ovid W. Eshbach...............*1st Vice-President*
Charles E. DeLeuw...........*2nd Vice-President*
John F. Sullivan, Jr...........................*Treasurer*
Leroy F. Bernhard..................*Trustee, 1949-52*
Ludwig Skog..........................*Trustee, 1949-52*
L. E. Grinter..........................*Trustee, 1950-53*
Arthur W. Howson...............*Trustee, 1950-53*
A. P. Boysen..........................*Trustee, 1951-54*
W. R. Marston.......................*Trustee, 1951-54*
Gustav Egloff...........................*Past President*
H. P. Sedwick...........................*Past President*
J. Earl Harrington...............*Executive Secretary*
William E. Schweitzer...................*Chairman, Publications Committee*

J. EARL HARRINGTON
Editor and Business Manager

FRANCES A. HENKIN
Managing Editor

GENERAL AND EDITORIAL OFFICES
HEADQUARTERS OF
WESTERN SOCIETY OF ENGINEERS
84 E. RANDOLPH STREET
CHICAGO 1, ILLINOIS
TELEPHONE: RA NDOLPH 6-1736

The Society does not assume responsibility for statements and opinions in articles, papers and discussions appearing herein. All material must be submitted on or before the 10th of the month prior to date of publication.

•

Copyright 1952 by the
WESTERN SOCIETY OF
ENGINEERS

•

Permission is given for the reproduction of any material herein, provided due credit is given.

Single copy ....$ .50
Annual subscription 4.00
Foreign subscription 6.00

Entered as second-class matter September 23, 1948 at the post office at Evanston, Illinois under the Act of March 3, 1879.

Midwest Engineer

A Publication of the

WESTERN SOCIETY OF ENGINEERS

Serving the Engineering Profession

MAY, 1952 Vol. 4, No. 9

CONTENTS

Cover Story

Leonardo da Vinci's airplane consisted of a wooden board, two huge wings, a series of ropes and pulleys and a windlass. Lying prone on the board, his feet in leather stirrups connected by pulleys to the wings, the flyer was to move his feet up and down to flap the wings, while at the same time he was to operate the windlass with his arms and furnish motive power to raise the machine and propel himself through the air.

IT'S ALMOST TIME TO TEE OFF!

3rd Annual WSE Golf Tournament

Saturday, August 23

Chevy Chase Country Club Wheeling, Illinois

Come anytime from 8 A.M. to 3 P.M.

Enjoy a full day of golf and swimming . . .
a chicken dinner will be served at 7 P.M.
. . . and in the evening, a top notch play
at the Chevy Chase Summer Theater.

Arrange your foursome or party soon

MAKE YOUR Reservation NOW!

WSE 3RD ANNUAL GOLF TOURNAMENT

NAME ______________________________

ADDRESS ______________________________

TELEPHONE ______________________________

No. of Reservations	Golf and Dinner..................	$7.50	( )
	Golf Only..................	3.75	( )
Tee Off Time..................A.M.	Swimming Only..................	1.80	( )
Preferred ..................P.M.	Dinner Only..................	4.00	( )

Theatre $1.50 — $2.40 — $3.00

Amount Enclosed ______________________________

Make checks payable to Western Society of Engineers.
Mail to Headquarters, 84 E. Randolph Street
Chicago 1, Illinois

Winner in the
WSE Prize Paper Contest

Traffic Engineering Design of Dial Telephone Exchanges

By JAMES A. STEWART

The tremendous expansion in the telephone system since World War II plus the accelerated program of converting manual exchanges to dial operation has created an extraordinary amount of construction work in the system. Most exchanges have been greatly enlarged, many new exchanges have been built, and many additional lines have been installed to provide talking circuits between exchanges.

The responsibility for determining the quantities of such equipment required and the arrangement of this equipment has fallen on the telephone traffic engineer. Well over half of the money spent on new equipment is used to buy and build facilities recommended by the traffic engineer. The traffic engineer has, therefore, an important place in the business and to the telephone user in determining the quality of telephone service received and the amount of money spent for it. His objective is "to see that facilities of the *right* kind and of the *right* amounts are in the *right* place at the *right* time to give the *right* grade of telephone service."

The purpose of this paper is to show some of the methods used by the traffic engineer to fulfill his responsibility in the design of dial telephone exchanges, some of the fundamental considerations that are involved in this design, and how these fundamentals are applied to develop the calling characteristics of a particular exchange. Similar methods no doubt find application in many fields of engineering.

Mr. Stewart, one of the winners in this year's Prize Paper Contest, is a traffic engineer with the Illinois Bell Telephone Co.

Fundamental Data

One of the first things the traffic engineer must know in designing a dial exchange is the size, in telephone development, of the area to be served. In determining the size of exchange which he will design, the engineer must take into account the time required by the equipment engineer to prepare his specification, the time required by the manufacturer to do his engineering work on the job, the time required to manufacture the equipment, and the time required to install and test the equipment. For an exchange of any size, at least a year is ordinarily required from the time the traffic engineer prepares his recommendation until the equipment is installed and working.

It would be undesirable for an exchange to be built that would just care for the telephones expected at the time of its installation, for additional equipment would be required immediately thereafter. The traffic engineer must decide for how long a period of growth beyond the installation date the exchange should provide. This involves a consideration of the carrying charges on surplus equipment installed initially and not used at once, as compared with the engineering and other costs incident to the installation that are required each time an addition is made to the office. This period, sometimes called "engineering period," varies with the size of exchange, but for medium sized dial exchanges is about two years.

The traffic engineer must therefore design his exchange to care for the estimated requirement of the area about three years from the time he prepares his recommendation.

For an estimate of telephone growth, the traffic engineer refers to the estimate of telephone station development, which is based on surveys, records of past development, and other data such as population trends and records of the economic cycle. This estimate should show the number of stations of each type expected in the exchange each year for several years in the future. A typical total station growth graph is shown in Figure 1, which also shows the expected growth for four future years. Total lines and total terminals are also shown. (In this particular exchange, terminals represents telephone numbers.) From the above estimate, the traffic engineer selects the data pertaining to the particular period for which he is designing his exchange.

In selecting data on telephone development, the traffic engineer must keep in mind the growth characteristics of the exchange. Some exchanges, particularly summer resorts have a peak of telephone development during the summer months. Figure 2 shows an example of such a development. Others, such as college towns, may have a decided slump

in telephone development during the summer. Figure 3 shows a development of this sort. These factors affect the time that additional equipment is needed in the exchange and the length of time that it will last; for example, if enough equipment is provided to care for the summer peak, the same amount of equipment will care for the requirements through the following winter until the beginning of the next summer's increase.

Traffic Data

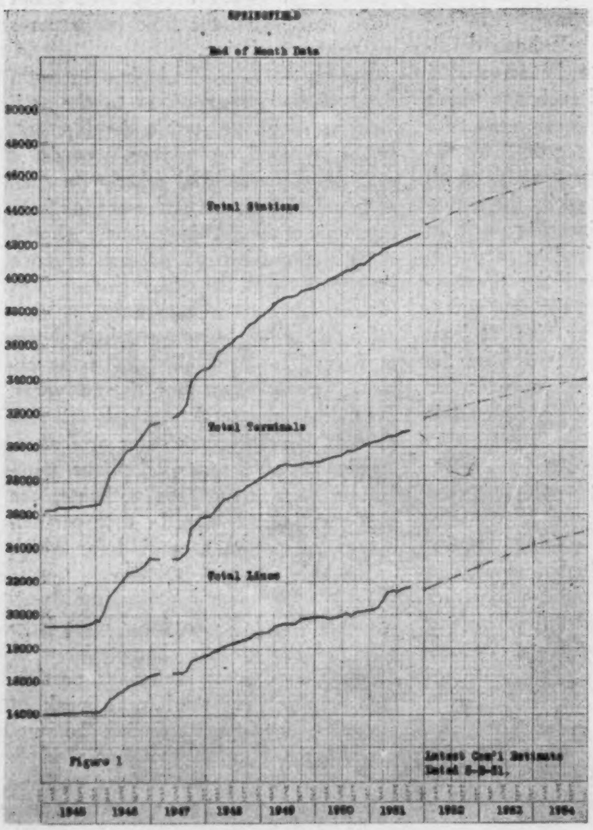
The traffic engineer needs to know about the calling characteristics of the subscribers in the community that the exchange serves. How many calls do the subscribers make? When do they make them? Who do they call? How long do they talk? These are important questions about the calling characteristics for which the traffic engineer must find the answers. He is particularly interested in these answers for the busiest hour of the day in the busiest season of the year, for if he provides equipment for this busy period, he will have provided enough for less busy periods.

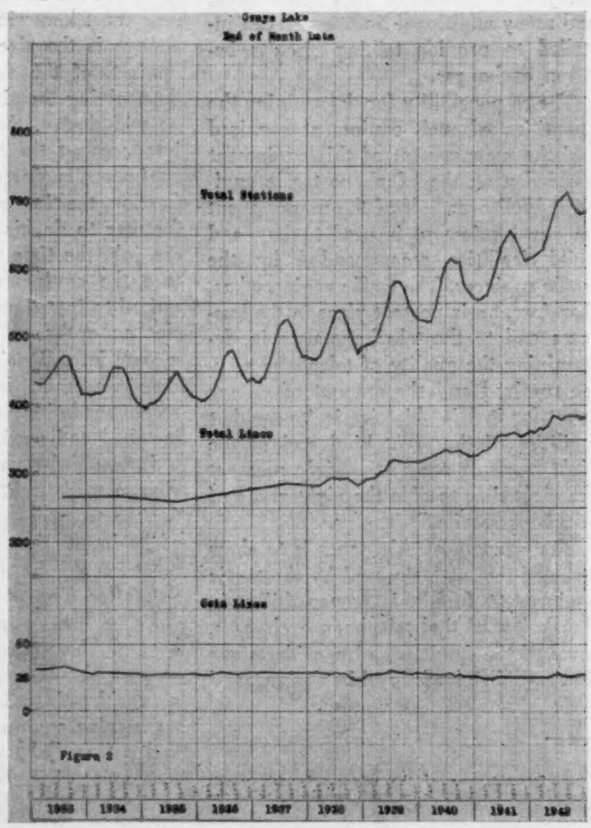
While it is necessary to provide equipment to carry the traffic loads in the busy period, these periods should be sustained for some time and the load should recur at these levels at rather frequent intervals. It is not planned to provide equipment for the very unusual situations, such as fires, storms or very severe weather. To provide equipment for such situations which occur infrequently would be uneconomical.

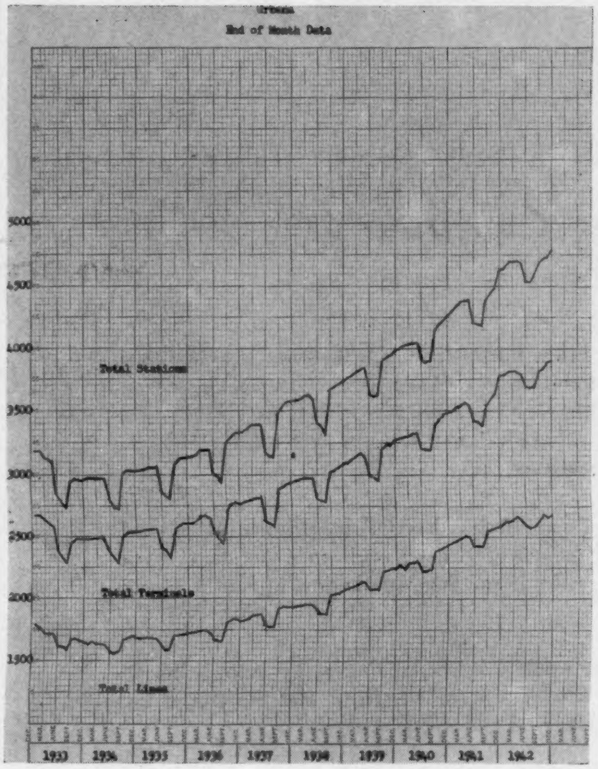
The number of calls that the subscribers make it ordinarily found by counting the calls placed during every clock hour on two representative business days (known as official peg count days) every month (the interval may be quarterly or annually for small exchanges). The hour that most calls are placed can be selected by inspection. After the data from these counts has accumulated over a period of time, the busy season can be selected. In order that the data may be used to estimate calls in the future, they are usually reduced to a calls per telephone basis, referred to as the calling rate. On total originating calls, the calling rate may range from .25 in the busy hour to over 1.0. Calling rates can be multiplied by the estimated telephones in the exchange to give an estimate of calls for the exchange. Graphs of the calling rate (see Figure 4) are plotted monthly so that trends may be observed and representative call rates selected for future periods.

The average length of time that the subscriber talks affects the amount of exchange equipment needed. This time is referred to as the "holding time." Holding time data are usually taken only during the busy season and during the busier hours of that season. These data are frequently secured by a sampling method in which the holding time is measured for calls selected at random during the period for which the holding time is desired.

In the design of a dial telephone exchange the engineer is interested in the combined effect of calls multiplied by holding time. It is that effect which determines how much the equipment will be in use. This combined effect is referred to as "usage." Usage data is required for determining the month of







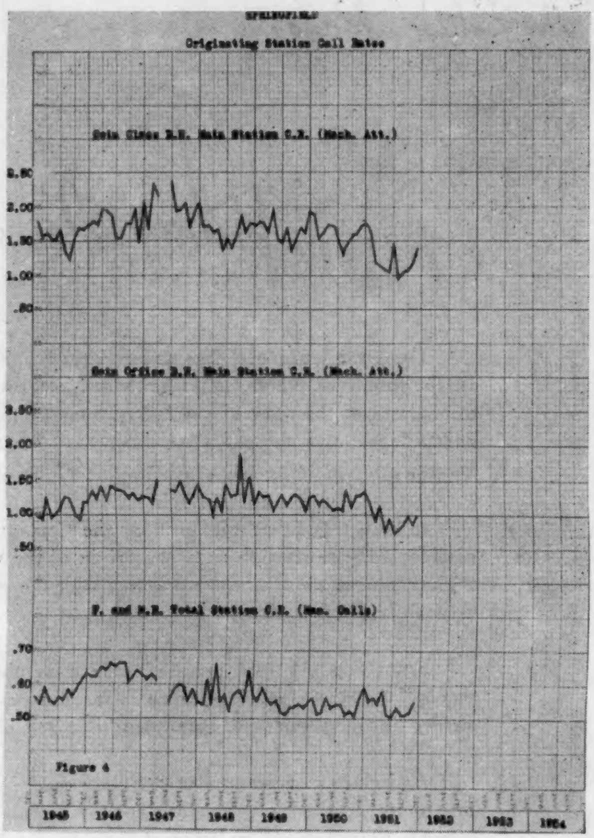


Figure 4

originating and terminating equipment to be provided in the dial exchange, for determining the number of telephone circuits, called trunks, required between the different switches in the exchange and between different exchanges in an area having several exchanges. Usage is generally expressed as equivalent one hundred second calls (calls times holding time in seconds, divided by 100) and abbreviated as CCS.

Calling rate and holding time data are required not only for the total calls that the subscriber makes, but also for special classes of calls that he may make, such as calls for information service, repair service and assistance. These data are obtained from counts of calls to these points taken at the same time as the originating call count mentioned above.

New equipment recently developed makes it possible to measure telephone usage directly on all equipment and on all trunk groups in a dial exchange. This equipment improves the accuracy of the data and can ultimately replace the cumbersome method of determining call rates and holding times separately.

Usage data can be obtained directly on groups of trunks that are equipped with registers that indicate the number of times all trunks in the group are busy. By the use of appropriate tables, the number of registrations will show the average usage of the trunk group for the period of the registrations.

Long distance calls are important enough that special consideration is given to estimating these calls. The equipment used is more expensive than that used for local calls; the cost to the subscriber even with the many reductions in rates is still considerably more than that for local calls; and the volume of such calls is more sensitive to economic trends than that of local traffic. It is beyond the scope of this paper to discuss the many factors affecting the design of the long distance system, but long distance items affecting the design of the dial exchange will be considered.

The basic data for estimating long distance calls is the record of average business day calls for the month. A graph (figure 5) is used showing this record month by month. From this graph trends may be observed, the busy season selected, (generally the summer), and the growth in this traffic estimated. Anticipated economic effects can be taken into account in these estimates and at times growth may be estimated in a negative direction. By using special counts indicating the relationship between total day and busy hour traffic, and with special holding time data on this type of traffic, the engineer can estimate the busy hour usage on the circuits handling calls from the dial equipment to the long distance operator.

Choice of Equipment

After the traffic engineer has collected his traffic data, there are a number of items to be considered before his recommendation can be prepared. He must know the type of equipment to be used in the exchange. At times, the equipment to be used can be decided upon by an inspection of the characteristics of the exchange. At other times it is necessary to prepare several designs for

(Continued on Page 17)

The Editor's Page

What Is an Engineer?

The term "engineer" has suffered much misuse. In the minds of some, it has very definite limits. In the minds of others, it is limitless. Most people think of an engineer as the coordinator and administrator of the work of specialists. Some think of him only as a designer, others as the man who runs a locomotive engine. When one hears of a street cleaner referred to as a sanitary engineer, the necessity for defining the word "engineer" becomes apparent.

In recent months, publicity for the Centennial of Engineering, has enlightened those within and outside of the profession as to the origin of the word "engineer." They have learned that the first real engineers were those whose work was with the engines of war and thus were known, in most instances, as governmental engineers.

Branching out into private practice as civilians resulted in the coining of the term "civil engineer." Advances and inventions in machinery, the development of electricity and the tremendous strides in industrial chemistry led to mechanical, electrical and chemical engineers.

As industry became more complex, these fundamental branches of engineering were broken down into more detailed sub-divisions such as automotive, diesel, maintenance, aeronautical, structural, mining, illuminating, agricultural, bridge, combustion, fire protection, geological, petroleum, radio, refrigeration, heating and ventilating, communications and a multitude of others.

There are almost as many kinds of engineers as there are people engaged in the profession of engineering. If one but thinks of all the men within his acquaintance in engineering, it is difficult to find two who have identical work. It is little wonder that we confuse the undergraduate and the layman.

There is a large group of people trained in engineering who are somewhat removed from direct engineering application but who are nevertheless performing important engineering jobs. They may be in industrial or labor relations, law, public relations, insurance, retailing, wholesaling or warehousing, or in systems and methods of work. It is such a variety of engineers who make up the profession today. Western Society, while not encompassing all the fields mentioned above, still to a great degree, provides a common meeting ground for a wide variety of engineers. That alone is good reason for being a member of the Western Society of Engineers. Membership provides an opportunity to broaden oneself by meeting, and talking with technically trained engineers who hold an assortment of important jobs in engineering, commerce and industry. To fail to take advantage of the opportunity of membership is tantamount to a lack of interest in personal development. WSE welcomes engineers in all fields who meet the requirements of membership and who wish to avail themselves of these many opportunities.

Mr. Mosbaugh

Missouri Valley Development

By *HARRELL F. MOSBAUGH*
Chairman, Interior Missouri Basin Field Committee

The developments which are taking place in the Missouri Basin today are truly a tremendous undertaking. The total cost of this program is now estimated at nearly $10 billion. The Corps of Engineers and the Department of Interior have authorized programs which amount to about $3 billion each and the Department of Agriculture has proposed a program also estimated to cost about $3 billion of federal funds. The cost of resource development programs of the 10 states in the Basin total about one-half billion dollars. With programs of such proportions you can see why the manner in which the work is conducted becomes a national consideration.

As you may know, the proposals of the Corps of Engineers and Bureau of Reclamation were epitomized in the so-called, "Pick-Sloan" plan which was authorized by the Flood Control Act of 1944. In the past few years these two agencies have been annually in the neighborhood of $100 million each for construction of some and further investigations of other features of this plan.

Mr. Mosbaugh has been actively engaged in the conservation, control and the use of our natural resources for the past 15 years. He delivered this paper before the Western Society on March 3, 1952.

Soon after the authorization of the Bureau of Reclamation's program of dam building, for irrigation, flood control and power production, the Secretary of the Interior established a unique financial arrangement whereby the other Interior agencies responsible for the development of the resources of the Missouri Basin were provided with funds to perform the necessary investigations in their respective fields. This budgetary arrangement is unique and it is particularly significant that an entire department of the government is utilizing all of its technical skills toward the common goal of resource development. In addition to the Bureau of Reclamation; the Bureau of Indian Affairs, the Bureau of Land Management, Fish and Wildlife Service, Bureau of Mines, National Park Service, and Geological Survey are all making studies to determine the needs for and possibilities of development.

Starting with the Bureau of Reclamation, which has by far the largest stake in the Missouri Basin of any of the Interior agencies, I should like to discuss each of the programs and the progress that has been made to date. Although the work is highly specialized, probably every type of engineering known to our peace-time economy is being utilized in this undertaking.

Briefly, the Bureau of Reclamation plans to develop a total of 5,270,000 acres of new irrigation and provide supplemental water supply to 1,150,000 acres. The comprehensive program provides for storage in some 138 reservoirs aggregating a total capacity of about 110,000,000 acre feet. This includes reservoirs in both the Corps of Engineers and Bureau of Reclamation plans and provides for full utilization of the water resources for irrigation, flood control, power development and navigation as now envisioned.

Requirements for power in the Basin totaled 4.6 million kilowatts or 18.2 billion kilowatt-hours in 1950. They are expected to increase to 13.4 million kilowatts or 58.3 billion kilowatt-hours in 1970. Estimates are based upon reports of the Federal Power Commission with adjustments for known increases in actual loads over expectations and for potential development of new industrial activity in the Basin.

The generating capacity in the Basin totaled 4.5 million kilowatts in 1950 of which 18 per cent was hydroelectric, 78 per cent thermal electric, and the remaining 4 per cent from internal com-

bustion engines. Approximately half of the existing hydroelectric capacity is in Montana and Wyoming.

Nine federally-owned and operated hydroelectric plants are located in, or contribute directly to the Missouri River Basin power supply. They have a capacity of 158,000 kilowatts and an average annual generation of 872 million kilowatt-hours. Ten other federal plants are under construction as features of multiple-purpose projects and 22 more are scheduled for construction. Total capacity of the 41 plants will be 2.6 million kilowatts and annual generation will average 11.6 billion kilowatt-hours. Federal plants include developments by the Bureau of Reclamation and the Corps of Engineers.

The supply of power available from existing plants, those under construction, and those scheduled for construction, will not be sufficient, however, to meet the total future Basin-wide load requirements. A shortage of some 2.0 million kilowatts is expected by 1960 and 7.9 million kilowatts by 1970 unless additional capacity is made available. The majority of the power development is coming from the main-stem plants of the Corps of Engineers. The Bureau of Reclamation is well advanced in the construction of transmission lines which will interconnect these plants and distribute the power to load centers. Some 3,500 miles of high voltage transmission lines have either been completed or are now under contract. In addition to the power produced at main stem plants some 177,000 kilowatts will be developed by the Colorado-Big Thompson Project which is now nearly complete.

The Colorado-Big Thompson is a transmountain diversion project which collects water from an area where water resources exceed the requirements and transports it to an area where water resources are deficient. Large amounts of power are developed enroute. Water is impounded in Granby Reservoir, pumped to Shadow Mountain and Grand Lakes and then diverted by gravity under the Continental Divide through the 13-mile long Adam Tunnel. There it is used and reused through a series of power drops and finally re-regulated by Carter Lake and Horsetooth Reservoirs for irrigation of some 615,000 acrs in northeast Colorado. All in all there are nine large reservoirs, three pumping plants, five power plants, and a chain of canals, penstocks, tunnels, closed conduits and siphons. The power generated will be interconnected with the large transmission network of the Missouri Basin Project. The proposed interchange of power from the eastern and western slopes presented a minor crisis when the Bureau of Reclamation considered clearing a right-of-way through the Rocky Mountain National Park for a high voltage transmission line. This brought protests from many sources and the solution was the construction of a water-proof cable circuit through Adams Tunnel under the Continental Divide. This consisted of a high-pressure gas-filled pipe which enclosed three separately insulated copper conductors. The pipe is supported in the arch of the tunnel by stainless steel hangers. The power drop into Estes Park Plant is one of the spectacular engineering features. Water from the western slope of the Rockies enters through parallel penstocks each 0.8 miles long. These penstocks 78 inches in diameter will have a capacity of about 1,300 second feet. Estes Power Plant will operate under an average head of 534 feet and will produce 120 million kw hours annually. Since this structure and others are in an area world-famous for scenic beauty, many of the designs were altered to protect the aesthetic qualities. The Colorado-Big Thompson concept of inter-basin transfer of water from surplus to deficient areas is typical of the normal planning trend in western areas as water becomes more and more valuable. Another proposal of even larger proportions, discussed in the last issue of *Civil Engineering*, is the Bureau of Reclamation's investigation the possibility of transferring water from the Pacific Northwest to the deserts of the Southwest.

Thirteen New Dams

In the past five years, 13 multi-purpose dams have been completed in the Missouri Basin by the Bureau of Reclamation and four by the Corps of Engineers: Heart Butte and Dickinson Dams in North Dakota; Shadehill, Augostura, and Cold Brook Dams in South Dakota; Medicine Creek, Enders and Harlan County in Nebraska; Cedar Bluff and Kanopolis; Cherry Creek, Bonny, Granby, Olympus, and Horsetooth Dams in Colorado; Kortes and Boysen Dam in Wyoming. Under construction are Trenton Dam in Nebraska; Carter Lake and Williom Creek Dams in Colorado; Keyhole Dam in Wyoming; Canyon Ferry Dam in Montana, Garrison Dam in North Dakota, and Oahe, Fort Randall and Gavins Point Dams in South Dakota. Two new dams are scheduled for construction this spring, Kirwin Dam in Kansas and Jamestown Dam in North Dakota. Money has been requested for construction of Tuttle Creek Dam in Kansas in 1953.

Dams for irrigation, power, and flood control purposes are perhaps the most spectacular and expensive undertakings in the Missouri Basin development. Intensive and important studies are being conducted in many other fields.

Although broad in its scope and aspirations, the so called, "Pick-Sloan" plan did not delve deeply into the secondary benefits which might accrue from the project. Time had not permitted a suitable evaluation of these

NASH BROTHERS CONSTRUCTION CO., INC.

Engineering Contractors

1840 South Kilbourn Avenue

Chicago 23

other aspects prior to the authorization of the "Pick-Sloan" plan. Since then the government agencies and various committees have been studying these aspects and attempting to evaluate them. It was known that recreational opportunities were important; fish and wildlife was a major industry; Indian reservations occupied a part of some of the reservoir sites and would be flooded out; there were millions of acres of public domain lands, which were in dire need of development; and mineral and fuel resources were thought to be abundant, although unlocated and unappraised. These were some of the problems which required solution before we could lay claim to a comprehensive plan. All required more basic data and more study.

Work of the Committee

The Missouri Basin Field Committee, of which I am Chairman, is composed of the ranking government officials for each of the Interior agencies I have mentioned. This Committee which was given the assignment of coordinating investigations, exchange of information, reports and plans meets monthly to discuss problems associated with work schedules. By these means we are able to effect a high degree of coordination of a program of resource development. This may not seem like a significant accomplishment on the face of it, but those of you who have come into frequent contact with government agencies know that they sometimes work in different directions either inadvertently or by design. A few examples of how such a situation has been prevented to a marked degree in the Missouri Basin.

The National Park Service has the assignment of determining the need for additional recreational facilities, particularly at the newly-constructed reservoirs. It studies the various possibilities and finally draws plans for making the best recreational use of the facilities to be built. By coordinated scheduling, these studies are made before the dams are in the construction stage thereby preventing many complications which would occur at a later date. The National Park Service also provides funds to the Smithsonian Institution to study the archeological and paleontological aspects of the reservoir areas before they are covered with water. These scientists are able to excavate the historical sites in the reservoir areas and to study the earlier occupancies and obtain artifacts and other specimens of historical significance. For a while, these scientific crews were working against time, with the rising water in the reservoirs filling their excavations almost as soon as they were inspected. At the present time, however, they are able to work well in advance of construction and are cataloging a tremendous amount of information about the early inhabitants of the Basin. Although funds permit studying only about 10 per cent of the sites, probably more information has been obtained in the past six years than during all previous explorations in the Basin.

Utilization of fish and wildlife resources in the Missouri Basin is an important industry. The people are jealous of this abundant resource, and rightly so. One of the first questions that was asked, when construction was proposed was, "How will this effect the fishing and hunting?" Our experience at that time was meager and our answer was, "We don't know." As a result, intensive studies and recommendations have been made on all features in the current program to determine what effect they will have on fish and wildlife. Thus far, we have found that the construction of the reservoirs on the main stem and major tributaries is generally beneficial to the fishing interests, but somewhat detrimental to several species of wildlife. Irrigation projects in the semiarid areas were found to substantially increase the upland game potential. To offset any detrimental effects from reservoir construction, recommendations are being made for the operation of the system and plans are prepared for wildlife habitat to replace that inundated by the reservoirs.

The "Indians" in the Missouri Basin presented a problem in human resources. We have about 70,000 of them living in some 25 reservations. Quite often the construction of a dam will result in flooding a portion of an Indian reservation. In other cases, the Indians are interested in obtaining storage water for irrigation. By coordinated efforts of all agencies these problems are being solved.

Laws pertaining to the Indian are legion and complicated. Along with plans for the development of Indian resources we are gradually approaching the time when the Indian can be assimilated into society with no segregation and no special privileges.

The Bureau of Land Management has jurisdiction over some 20,000,000 acres of public domain land in the Basin. This land on the whole is poor. It is the least productive and the most erodible land left in the Basin, which may explain why it is still in government ownership. This agency has made detailed classifications of half of this land and has completed development plans for that portion which is to be retained in federal ownership. It has recommended that a substantial acreage be disposed of either to other federal agencies, states, municipalities, or private interests.

Mining engineers are particularly interested in the studies being conducted on the mineral and fuel resources by the Bureau of Mines. The Missouri Basin is literally loaded with coal; it contains some 93 per cent of all the subbituminous coal and 97 per cent of the lignite coal in the United States. Recently there has been some discussion on the oil discoveries in North Dakota and Montana. As a result of improved techniques and deeper drilling tests, they are discovering oil in locations which previously were not thought productive. The extent of the oil reserves in the Williston Basin, of course, is undetermined, but we have every reason to believe they are large. Already, the effects of this oil boom are being felt by the increasing power demands.

Resources of the Area

Petroleum and gas are produced in five of the Misosuri River Basin states. These five states have provided eight per cent of the total national petroleum output in the period from 1859 to 1944. The same states contain an estimated seven per cent of the nation's known reserves.

A nationwide survey is being made to provide information on areas suitable for synthetic fuel production. One of the areas being studied is in southeastern Montana. Preliminary indications are that the coal deposits of the area are suitable for the production of 53 billion barrels of synthetic motor fuel. The proved crude oil reserves of the entire United States are somewhat over 20 billion barrels. Other Basin

(Continued on Page 19)

OFFICERS — TRUSTEES — TEAM CAPTAINS — MEMBERS

THANKS

FOR A GOOD JOB

WELL DONE

Your Cooperation And Effort

Made The Drive Successful

WATCH W.S.E. *GROW*

Reviews of Technical Books

Available at WSE Headquarters

Theory of Vibrations

Theory of Vibrations for Engineers, by E. B. Cole. The Macmillan Co., New York, N. Y. Second Edition, 1952. 334 pages. $3.00.

This book should prove useful to engineering students and all who may be making their first serious study of the subject. It presents the fundamental principles of the theory and the methods employed for eliminating vibration in modern machinery. Only the most elementary knowledge of the calculus is assumed, full explanation of all advanced mathematical processes being given.

The author leads the student through simple harmonic motion, natural vibrations of systems, damped vibrations, and forced vibrations, to earthquake recorders, critical speeds of engines and shafts, dynamic loads, beams, etc.

A bibliography listing books suggested for further or more advanced study is included.

Throughout the text, liberal use is made of diagrams and examples. It is adequately indexed.

H.P.H., W.S.E.

Public Health Engineering

Engineering in Public Health, by Harold E. Babbitt. The McGraw-Hill Book Company, Inc. New York, N. Y. First Edition, 1952. 582 pages. $8.00.

This book is intended to meet the needs of the professional engineer practicing in the field of public health, and it should be useful to the student of the subject of engineering in the control of the environment for the protection of the health and the promotion of the comfort of man.

Early chapters are devoted to an introduction to the entire field of public health work, its aims, the nature of the duties of workers, and the requisite administration to attain maximum efficiency in a working team. Characteristics of disease, means of transmission and prevention are discussed. The inter-relation of food, milk, water, sewage and other wastes, animals, and other factors in causing and conveying disease are treated at length.

Some of the subjects discussed include plumbing, heating, ventilation, noise control, lighting, refuse collection and disposal, odor control, and many other related functions.

In the text are included details on the new pesticides, poisonous and furingants, diatomite filters, fluoridation of water, and the disinfection of air with aerosols and ultraviolet light.

Numerous references are given at the end of each chapter amplifying aspects of the subject matter contained therein.

Thirty pages are devoted to an excellent index.

H.P.H., W.S.E.

PETER J. O'BRIEN & CO.

Paving
Contractors

•

4501 WEST CORTEZ STREET

•

CHICAGO 51, ILLINOIS ALbany 2-0766

MORRISON CONSTRUCTION CO.

ENGINEERS CONSTRUCTORS

SINCE 1925

Industrial Projects
Public Utilities

TELEPHONES
CHICAGO ESsex 5-7680; HAMMOND Sheffield 5036

MAIN OFFICE
1834 Summer Street, Hammond, Indiana

Delegates From 16 Foreign Countries To Attend Centennial Convocation

At least 16 foreign nations will officially participate in the Centennial of Engineering to be celebrated in Chicago this summer, according to its president, Lenox R. Lohr.

This foreign participation is in addition to the plans just announced by the Mutual Security Agency at Washington to bring a special mission of 200 especially chosen European engineers to the Centennial as part of a five-week inspection tour of the United States, during which they will study American production methods.

Mr. Lohr also announced that the number of American engineering societies and associations pledged to take part in the Centennial has now reached 58. They have a combined membership of almost 350,000 professional engineers covering practically every technical and scientific field. Prominent in shaping the program and other activities for these various participating groups are former president Herbert Hoover, and Charles F. Kettering, world leader in engineering research.

Largest single delegation announced so far will come from the Engineering Society of Norway. It will have 17 members. The Royal Society of Industrial Engineers, Belgium, will have an 11-man delegation; while the combined group representing Great Britain's Institution of Electrical Engineers, Institution of Civil Engineers, and Institution of Mechanical Engineers is also expected to show large proportions. The British electrical engineers will be headed by Sir John Hacking.

Dr. Takeo Fukuda, of Tokyo University and vice president-elect of the Japan Society of Civil Engineers, will head his nation's delegation. France has chosen George Darrieus, president of its Society of Civil Engineers and member of the French Academy of Science, to lead its national group which will also include members of other French technical bodies.

Other countries with assured representations from among their leading scientists and engineers are The Netherlands, Switzerland, Italy, India, Canada, Mexico, Cuba, Peru, and Uruguay.

The Nationalist Chinese Government will send two official delegations from its headquarters on Formosa to the Centennial of Engineering. This makes 16 foreign nations that will be represented by their leading scientists and engineers.

One of the Chinese groups will represent the Chiang Kai-shek Ministry of Economic Affairs, and the second, the Chinese Institute of Engineers.

There will be five members in the former, headed by Hung-hsun Ling, chairman of the board of the Chinese Petroleum Corporation. The second group will have 13 members, with S. Shee Wang, of the Taiwan University faculty, as chairman.

Lenox R. Lohr, president of the Centennial, also announced that South America will send 150 to the celebration. They will come for the international convocation, scheduled from September 3 to 13.

More than

15,000 BOILER PLANTS

of all types and sizes will testify to the

OUTSTANDING PERFORMANCE OF "DIAMOND" PRODUCTS

DIAMOND POWER SPECIALTY CORPORATION

LANCASTER, OHIO

Soot Blowers • Water Gauges and Columns • "Utiliscope" (Industrial Television)

REINFORCED CONCRETE . . . DRIVEWAYS . . . FLOORS
. . . FOUNDATIONS . . . SIDEWALKS . . . PAVING

Central Cement Construction Co.

Licensed Contractors

Residential and Industrial

AL. DALIEGE

3515-19 So. Hoyne Avenue — Chicago 9, Illinois

Phone LAfayette 3-4600

New Members Named To Centennial Board

Two more members have been added to the board of directors of the Centennial of Engineering which already had included numbered among its personnel 37 of the nation's foremost scientific and engineering figures, including Herbert Hoover and Charles F. Kettering, wizard of the automobile world.

The latest additions are Alva W. Phelps, of Chicago, chairman of the Oliver Corporation; and Harry A. Winne, of Schenectady, N. Y., vice president of the General Electric Company.

Crerar Library

Notes and News

Two research grants have recently been received by the Library, one from the Rockefeller Foundation for the study of the Library's classed catalog, and the other from The National Science Foundation for an analysis of techniques used in Research Information Service. The program for each of the studies is under way.

The grant from the Rockefeller Foundation, covering the twelve-month period beginning June 1, 1952, will have a twofold objective:

1. It will enable the Library to undertake work that will result in making the Classed Catalog a more vital research tool to the users of the collections; and

2. It will permit the preparation of a manual for the construction of classed catalogs for use in Crerar and in libraries which do not now include this important research device.

When scientific literature was in its 19th century adolescence such a record of holdings was a comparatively simple matter to maintain. But with expansion of scientific knowledge and the subsequent birth of great numbers of scientific fields, old classification systems became outmoded and inadequate. In an attempt to keep pace, without the detailed analyses of subjects needed for the work, the classed catalog "just grew." As a consequence, instead of being the efficient working tool it was meant to be, this catalog often fails to serve the reader adequately. The intensive study now being undertaken will result in some immediate improvements and establish the basis for long term development of the catalog.

The second grant, also covering a twelve-month period, will study the functions and organization of information services in scientific libraries. This grant comes from The National Science Foundation and the objectives in this case are threefold:

1. Analysis of the techniques used in Research Information Service at The John Crerar Library;
2. Evaluation of these techniques for dissemination of scientific information; and
3. Experimentation with other techniques.

The establishment of RIS in 1947 was an almost unique venture in public library service and an analysis of work done during these first years should have great value for the future growth of such services, in Crerar and in other libraries throughout the country.

The project will include intensive review of all the work done by RIS during the past four years, with respect to types of companies and other agencies for which library research has been completed, types of research studies under taken and procedures followed on different types of RIS assignments. There will be experimentation and testing of techniques for developing data and literature files in research laboratories through the service of RIS and experimentation with such other techniques for library research as may be developed during the course of the study.

HOW TO *Tame* A TIGER!

Sewage sludge gas is like a tiger in one respect—both are dangerous if they get out of hand. P. F. T. Gas Safety Equipment "tames" sewage sludge gas—renders it "gentle as a kitten"—and useful too.

Whether sewage gas is utilized in gas engines for power, wasted without odor by burning in a P.F.T. Waste Burner or used for Digester and building heating with a P.F.T. Digester Heater, there is a P.F.T. Equipment to safeguard against every contingency that might arise in handling sewage sludge gas.

P.F.T. Gas Safety Equipment includes Combination Pressure Relief and Waste Gas Flame Trap Units, Flame Traps, Waste Gas Burners for exterior use, Pilot Line Flame Cells, Low Pressure Check Valves, Gas Pressure Regulators, manually operated Drip Traps, Accumulators for Condensate and Sediment, Gas Pressure Indicating Gauges, and auxiliary safety equipment such as Digester Floating Cover Position Indicators. Every unit service-proved in numerous installations — sound engineering evident throughout the line. Typical gas piping arrangements are detailed in Bulletin 221.

P.F.T. PACIFIC FLUSH TANK CO.
Waste Treatment Equipment Exclusively Since 1893
4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS
NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

Combustion Symposium at MIT to Begin September 1

Plans for the 1952 International Symposium on Combustion, to be held at the Massachusetts Institute of Technology from September 1 to 5, have been announced by the symposium committee. The Symposium will be open to all who are interested in combustion.

Since the last symposium was held in 1948, the accelerated pace of combustion research throughout the world has yielded an important body of new knowledge. Much of the new knowledge will be presented at the symposium in some 100 papers from Great Britain, France, Holland, Belgium, Germany and Japan as well as from the research laboratories and educational institutions of the United States. As least 50 foreign experts in the field will attend.

Papers are now being reviewed by a Papers Subcommittee of the General Symposium Committee of 68 American and 12 foreign members. Emphasis is being placed on the physical aspects of combustion, particularly wave phenomena and turbulence, treated from both experimental and theoretical standpoints.

Typical fields in which papers will be presented are ignition; stabilization in laminar and turbulent flow; limits of inflammability and detonability; instability phenomena; microstructure of combustion waves; theory of flame propagation; flame-jet structures and combustion processes in rocket systems.

In addition to these fields, plans have been made for several survey papers and round-table discussions on special topics.

The complete papers will appear later in a single volume, similar to that issued after the 1948 Symposium. This volume, roughly 750 two-column pages, should constitute an important reference work in the field of combustion. Its partial subsidy by American industry will permit its prepublication sale at a relatively low price.

All facilities of the Institute will be open to registrants for the symposium and living accommodations will be available in M.I.T.'s Alfred E. Burton House to those who specifically request reservations in advance.

Requests for registration forms or for further information on the symposium should be addressed to Summer Session Office, Attn: Combustion Symposium Committee, Massachusetts Institute of Technology, Cambridge 39, Massachusetts, or to Professor Hoyt C. Hottel, Professor of Fuel Engineering at M.I.T., and Co-Chairman of the Symposium.

Power Exhibition Set for New York

Major improvements in power equipment to be seen at the 20th National Exposition of Power and Mechanical Engineering, to be held in Grand Central Palace, New York, next December 1 to 6, will reflect a marked trend toward the fully automatic generating station, a quick review of the known plans of exhibitors reveals. The automatic power plant is a reality already, but its recognition by the engineering profession as a basic element in design is a new development that is entering into long range planning, spurred by the continuing expansion of power demand.

Feedback, coupled combination controls for the entire equipment of the central station or industrial power plant have been in use for several years as auxiliaries for existing units, but the multiplication of new equipment in this line, and its rapid assimilation by engineers have led to a new line of thinking, in which future plants are being planned from the beginning as completely integrated units. Many new exhibits at the Power Show will disclose innovations designed to fit advanced concepts of the unified power plant.

Automatic power generation is compatible with the rapid advance of automatic process control, for which much of the equipment at the exposition has also been developed. Coincidentally this double-headed movement in the instrument field has given rise to a whole new vocabulary of terms, which is at present

GILBERT-HODGMAN, INC.

Electrical Engineers and Contractors

327 SOUTH LASALLE STREET

CHICAGO 4, ILLINOIS

Members W.S.E.—A.I.E.E.

HArrison 7-8774

READY COAL & CONSTRUCTION COMPANY

- HEAVY CONCRETE CONSTRUCTION
- RAILROAD FACILITIES
- BRIDGES
- PAVING
- GRADING
- SEWERS

BOULEVARD 8-4311
4911 SO. SHIELDS AVE.
CHICAGO 9, ILLINOIS

under review by the American Society of Mechanical Engineers, under whose auspices the exposition is being held.

The annual meeting of the ASME will be held during the week of the show, which is under the management of the International Exposition Company, with permanent headquarters in Grand Central Palace. Charles F. Roth is manager of the exposition. E. K. Stevens, who has long been active in this work, is associate manager.

Five of IIT Faculty Lecture at Oslo, Norway

Chicago's Institute of Design of Illinois Institute of Technology last month was invited to show Europe how to teach modern design.

A team of five of the Institute's design authorities conducted a workshop on experimental design practice and delivered several major lectures at a design seminar in Oslo, Norway, June 5-25.

The team and a former member of the Institute faculty had the distinction of being the only U.S. representatives on the program.

This signal honor came as a result of a two-year survey of United States schools of design by Mr. and Mrs. Arne Korsmo, of Oslo, recently. Mr. Korsmo, a recognized design expert, is a member of the faculty of one of the five sponsoring schools. He was one of the few Europeans on the seminar program.

The Institute's team was made up of Konrad Wachsmann, architect-inventor; Hugo Weber, sculptor, painter; John Walley, industrial designer, exhibition painter and sculptor; his wife, Jano, ceramist and jewelry designer, and Ray Pearson, architect.

William Friedman, of Minneapolis, an architect, was the former Institute faculty member making the trip.

European educators, industrialists, and craftsmen attended the 20-day event, held at *Statens handverks-og kunstindustriskole* in Oslo.

The design workshop included an exhibition on design education prepared by students and staff at the Institute.

Individual lectures by team members included:

Mr. Wachsmann: "Industrialization and Research."

Mr. Weber: "Design for Living and Fundamental Integration." (He also will show his film entitled, "Vision and Flux." Technical films from the Illinois Institute of Technology library will be the subject of a separate program.)

Mr. Walley: "Design and Behavior."

Mrs. Walley: "Design and Home, U.S.A."

Mr. Pearson: "Building in Chicago."

Mr. Friedman will discuss "Museums and Education of the Consumer."

After the conference, Wachsmann attended the Congress of Modern Architecture in Venice, Italy, and Mr. and Mrs. Walley are touring Germany, Italy, Switzerland, and France for examples of modern art, architecture, and industrial design.

THE
ASBESTOS & MAGNESIA MATERIALS CO.
INSULATION
Approved Contractors and Distributors
for Johns-Manville
All types — Hot and Cold, Stack Linings and
Boiler Coverings, Refractories, Packings and
Insulating Brick
DIversey 8-4554 — 4562
2614 North Clybourn Ave. Chicago 14

ABBOTT
CONTRACTORS
INC.
•
3349 South Kedzie Avenue
Chicago 23, Illinois

BELL LUMBER & POLE COMPANY
Producers and Wholesalers
of
Transmission and Distribution Line Poles
Western Red Cedar — Douglas Fir — Western Larch
Wood Pole Preservation — (Non-Pressure)
Grade 1 Creosote or Pentachlorophenol Solution
Full Length Treating
Machine Shaving — Machine Incising
Roofing — Gaining — Drilling
524 Midland Bank Bldg.
MINNEAPOLIS 1, MINNESOTA
Phone: Atlantic 8277

COMPLETE SOIL TESTING SERVICE
• Laboratory and Field Tests
• Foundation Borings; Rock Coring
Analyses and Reports

John P. Gnaedinger — SOILTEST STS — Theo. W. VanZelst

SOIL TESTING SERVICES, INC.
4520 W. North Ave., Chicago 39, Ill

Rogers Park 4-1295
GR eenleaf 5-6960

CONTRACTING AND MATERIAL CO.
Engineers & Contractors
EVANSTON, ILLINOIS
1235 Dodge Avenue

Harza Engineering Company
400 W. Madison St.
Chicago 6, Illinois
Telephone RAndolph 6-3451

Ventilating and Air Conditioning
• • • •
Asbestos Pipe and Boiler Insulation
• • • •
JAMAR-OLMEN CO.
320 N. Harding Ave.
Chicago 24, Ill.
SAcramento 2-3070

ESTABLISHED 1913
WALTER H. FLOOD & CO.
CHEMICAL ENGINEERS
Inspection and Testing
Of Materials and Structures
Buildings, Roads, Streets, Airports
SUPERVISION OF CONSTRUCTION
CONCRETE CORE CUTTING
6102 S. BLACKSTONE AVE. CHICAGO 37
Branch—1332-4 N. Westnedge Ave.
Kalamazoo 53, Mich.

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office, 84 E. Randolph St., RAndolph 6—1736.

257-83 Joseph J. Tryzna, Senior Compounder, Ball Bros. Co., Rubber Div., Muncie, Ind.

258-83 Ernest A. McLeod, Assistant Engineer, New York Central Railroad, LaSalle St. Station.

259-83 Howard F. Peckworth, Managing Director, American Concrete Pipe Association, 228 N. LaSalle St.

260-83 L. J. Shumaker, Salesman-Engineer, H. H. Robertson Co., 221 N. LaSalle St.

261-83 George F. Bosch, Plant Engineer, The General Tire & Rubber Co., Garfield Rd., Wabash, Ind.

262-83 James M. O'Hara, Structural Designer, Vern E. Alden, 33 N. LaSalle St.

263-83 Harold L. Harmon, Supt. of Facilities, American Steel Foundries, 3200 Dickey Rd., East Chicago, Ind.

264-83 Curtis V. Smith, Trunk Studies Engineer, Illinois Bell Telephone Co., 212 W. Washington St.

265-83 Oscar E. Hewitt, Commissioner of Public Works, City of Chicago, R-406 City Hall.

266-83 Laurence E. Hill, Structural Engineer, A. J. Boynton & Co., 109 N. Wabash Av.

267-83 Frank M. Harms, Construction Engineer, A. J. Boynton & Co., 109 N. Wabash Av.

1-84 Neil D. French, Structural Designer, S. F. Nydam, 36 S. State St.

2-84 John P. Uitz, Jr., Structural Draftsman, Chicago Transit Authority, 1165 N. Clark St.

3-84 John M. Duffy, Jr., Sales Engr., Crane Co., 836 S. Michigan Av.

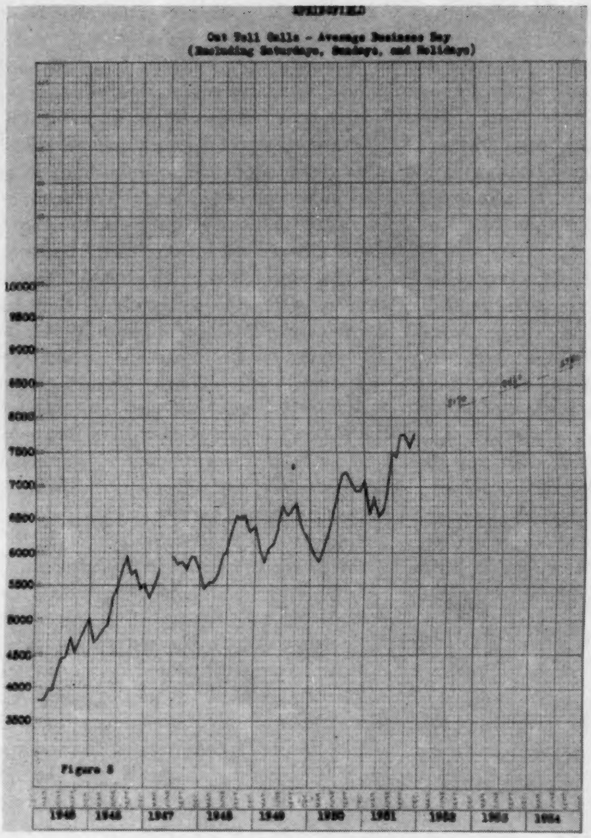
4-84 John Kapusnik, 5647 N. Washtenaw Av., attending University of Illinois.

5-84 Charles S. Michalski, Traffic Engineer, Citizens Traffic Safety Board, 20 N. Wacker Dr.

6-84 Richard C. Lindberg, Patent Lawyer, 209 S. LaSalle St.

7-84 Edward R. Foss, Jr., Sales Engineer, Laclede Arch Co., 5 S. Wabash Av.

W. H. LYMAN CONSTRUCTION CO.
General Contractors
•
134 N. LA SALLE • CHICAGO • STATE 2-8154



also fit in with the plans for nationwide toll dialing. It is desirable that the type of numbering plan be as uniform as possible throughout the country so that subscribers going from one place to another will be familiar with the system. Office names used in connection with numbers should be easily recognized all through the country. It is desirable that they be spelled as pronounced.

Restrictions may be placed on the numbering plan by the reservation of certain codes for special purposes, such as "O" of operator.

Some types of equipment require the use of special digits in the number of a special arrangement of the digits in order to operate properly. For example, the suffix digit on a rural subscriber's number has to be his party number on the line in certain types of dial systems.

Another item to be considered is the grade of service. Grade of service may be expressed in terms of the probability that a particular call will encounter a delay because all trunks are in use. A full discussion of the probability theory and its application in the design of telephone equipment is too involved to be given here, but this theory is the basis upon which telephone trunk group capacities in terms of call carrying ability are estimated. The call carrying capacity of a trunk group increases as the grade of service becomes poorer. For example, a group of ten circuits will carry 149 calls with a holding time of 100 seconds with a probability that one call in a hundred will encounter a delay. The same 10 circuits will carry 166 such calls if a delay probability of two calls in a hundred is acceptable.

Trunk groups are designed in practice to give delay probabilities ranging from one in a thousand (a very high grade of service) to approximately 25 to 40 in a hundred (a very low grade of service).

The selection of the grade of service to be provided depends upon the importance of the particular groups of trunks and the cost of providing the group. Trunk groups within an exchange are ordinarily designed for a delay probability of one in a hundred. The grade of service on toll trunks varies widely and depends somewhat upon the size of the trunk group. It is generally more economical to provide a higher grade of service on a large trunk group than on a small one as the efficiency in terms of usage per trunk for the same grade of service is much higher on the large group.

The traffic engineer must also consider provisions in dial exchanges for intercepting arrangements, arrangements for handling incoming toll dial calls, as well as incoming calls from the toll switchboard or other exchanges in the same

(Continued from Page 5)

the exchange, each using a different type of dial equipment. A cost study can then be made to determine the most economical type of equipment to be used. If different types of equipment have different service features, the traffic engineer must consider their advantages and disadvantages. The final decision as to the type of equipment to be used will be the type that will best balance service and cost.

After a decision has been reached as to the type of equipment to be used, a numbering plan can be selected. The plan selected will be as simple as possible for the type of exchange. It must be adequate for a long enough period so that number changes will not be required frequently. An exchange near other exchanges or in a metropolitan area must have a numbering plan that will fit into the general numbering plan of the area so that direct dialing in the area can be simple, and so that subscribers going from one part of the area to another will be able to use the system easily. The numbering plan selected must

Complete Facilities for Coating and Wrapping Steel Pipe

for

Protection Against Corrosion

Pipe Line Service Corporation

Main Offices — Franklin Park, Illinois

Plants

Franklin Park, Ill. — Glenwillard, Pa. — Sparrows Point, Md. — Harvey, La. Corpus Christi, Tex. — Longview, Tex.

area. He is also responsible for the traffic design of any switchboards associated with the dial equipment.

Use of Fundamental Data

After the fundamental data has been selected, the traffic engineer proceeds to find the flow of traffic through the dial equipment. He first determines where the calls come from and sets up a table similar to Table I, showing how many calls come from flat rate subscribers, how many from coin telephones, and how many from any other class of subscriber. Each of these classes usually requires a different type of originating equipment in order to care for the different rate treatment applicable to each.

A table similar to Table II showing the destination of the calls is next prepared showing how many calls go to each possible outlet from the office. Some types of traffic have a busy period different from that of the total originating calls. The calls for this period, known as a group busy hour, must be determined as well as the calls on the group during the originating busy hour. The group busy hour may be a different clock hour of the day from the originating busy hour, or it may represent a busy hour in a different season from that in which the originating busy hour occurs.

After the calls to the test desk, information desk, repair desk, long distance operator, and to any other exchanges in the area are determined, the remaining originating calls are assumed to go to local subscribers.

Three classes of calls peculiar to dial system operation are shown separately on the distribution table. These are assistance calls to the operator, reverting calls (calls to another party on the same line), and preliminary pulse calls. Preliminary pulse calls are calls in which the subscriber accidentally disturbs the dial or the receiver hook in such a way as to cause the dial mechanism to register a pulse equivalent to dialing the digit "1" before any number is dialed. Such calls receive special treatment in the dial equipment.

The distribution of traffic to subscribers is determined from the fundamental data and shown on a table similar to Table III. These calls are listed by source and include generally local calls, calls from long distance, and calls from other exchanges in the area.

In order to provide the features required to serve special types of subscribers such as rural party line subscribers or subscribers with several lines to a private branch switchboard, it is desirable in some types of dial exchanges in order to reduce the cost to assign these subscribers in segregated parts of the dial equipment. The special features need only be supplied in the portions of the exchange serving these subscribers. This segregation restricts the numbers available to these classes of subscribers in these exchanges. It also concentrates the traffic to these subscribers into certain parts of the equipment. The traffic engineer must determine how much traffic each of these special classes receives and provide sufficient equipment in the parts of the exchange serving them.

After the engineer has determined the flow of the calls through the equipment he is prepared to make his recommendation of the quantities and arrangements of the dial equipment in the exchange. The details of this recommendation will be determined by the type of dial equipment to be used. There are two general types of dial equipment in use. In one, the connection for the call is advanced as the dialing occurs. Step-by-step dial equipment is an example of this first type. In the other type of dial equipment, the dial pulses are recorded in one switch which controls the establishment of the talking connection through other switches of the equipment. Crossbar dial and panel dial are examples of the latter type.

Besides preparing the recommendation for the dial equipment, the traffic engineer designs arrangements for certain auxiliary equipment such as equipment for registering information on long distance toll calls for charging purposes, arrangements to permit direct subscriber dialing of calls to other exchanges, facilities for measuring the quality of the service, meters for securing traffic information on the various switches in the exchange, and the layout and requirements of switchboards associated with the exchange. A full description of the details of preparing the details of a traffic recommendation is too lengthy to be covered here, but during the preparation, the objective is to provide the best balance between service and cost.

TABLE I

Originating B. H. Call Rate and Holding Time Data

Class of Service	Stations	Lines	Sta. C.R.	Line C.R.	Calls	H.T.	C.C.S.
F. & M. R.	44552	23312	.60	1.15	26800	186"	49750
Coin	1013	805	1.11	1.40	1128	100"	1128
Total	45565	24117	.61	1.16	27928	182"	50878
Coin (Class B.H.)	1013	805	1.59	2.00	1610	106"	1705

TABLE II

Distribution of Originating Traffic

Class of Service	% Orig.	Calls	H.T.	C.C.S.
Local	94.9	26503	183"	48530
Recording	2.1	579	327"	1900
Information	2.5	706	50"	353
Test Desk	.2	56	80"	45
Repair Desk	.3	84	60"	50
Total	100.0	27928	182"	50878
Assistance	.3	84	182"	153
Reverting	.4	98	201"	197
Preliminary Pulse	2.1	592	20"	118

TABLE III

Distribution of Incoming Traffic

Class of Service	% Orig.	Calls	H.T.	C.C.S.
Local	94.8	26503	183"	48530
Toll	6.5	1823	225"	4102
Total	101.3	28326	186"	52632

(Continued from Page 9)

coal fields could also supply large quantities of synthetic liquid fuel. In addition, great quantities of liquid fuels are available from oil shales occurring in areas adjacent to the Basin in Colorado and Wyoming. Pilot plant tests indicate there may be early development of the oil shale for liquid fuels production.

Chromite occurs in Montana and Wyoming, but the principal deposit of about 11 million tons is in the Beartooth Mountains in Montana. It is, however, low grade and yields concentrates averaging less than 40 per cent chromic oxide and more than 15 per cent iron.

Large low-grade manganese reserves occur in the state of South Dakota. conomical recovery of manganese from these deposits is a possibility with improved technology and higher prices. The Bureau of Mines is conducting experiments to develop lower cost methods of recovering the South Dakota manganese.

The study of North Dakota lignite received some impetus when the Corps of Engineers removed large quantities of it in the abutments and borrow areas at the Garrison Dam site. The quantity of this lignite reached such proportions that the Bureau of Mines was called in to conduct experiments on methods of storing it. Some 5 million tons will be stock piled before they have completed construction. The disposition of this lignite has not been determined to date. Among other uses, consideration has been given to the construction of a pilot lignite burning steam-power plant. The Bureau of Mines has been very active in pointing up to private industry the possibilities for fuel and mineral developments in the Basin.

The programs of all of the agencies, which have been discussed depend to a greater or lesser degree on the basic information which the Survey collects. Collection of this data (stream-flow measurements, and topographic or geologic maps) requires carefully planned long-range programs to insure availability of basic data required for resource management plans. Many times the amount of such information available when the plan was formulated could have been well used. Only in the past year or two have the most urgent requests been satisfied. The Geological Survey now has long-range priority programs for most of its investigations which are based on requirements of all agencies.

With all these developments being proposed—most of which require water—the question is often raised, "Are you sure there is enough water for everything you propose?" This repeated question recently prompted the Missouri Basin Inter-Agency Committee to conduct a study on the, "Adequacy of Flows in the Misouri River". The annual flows of the Missouri River at Sioux City, Iowa, were taken as the key point of the study. Actual discharge at this point averaged 24,403,000 acre-foot annually for the period 1898-1949. Annual requirements affecting this flow were projected to the year 2,000. After careful study the Committee reported that the regulated water supply of the Missouri River is adequate to provide water for irrigation and other agricultural purposes as planned; to supply the downstream water supply and sani-

RELIABLE
Contracting and Equipment Company
GENERAL CONTRACTORS
Specializing in Underground Construction
100 N. LASALLE CEntral 6-1816

SAUERMAN BROS., Inc.
Engineers and Manufacturers
Slackline Cableway Excavators
Power Drag Scrapers
Scraper Systems for Open Storage of Coal and Bulk Materials
Tautline Conveying Cableways
522 S. Clinton St. CHICAGO

JOHN BURNS CONSTRUCTION CO.
JOHN F. O'MALLEY, PRESIDENT
CEntral 6-9776
105 WEST ADAMS STREET
CHICAGO

Chicago's Largest Office Building
A key location of convenience and prestige—that is the Insurance Exchange Building. A limited amount of space is currently available, and we will be glad to tell you what we have, if you will write to
INSURANCE EXCHANGE BUILDING
L. J. SHERIDAN & CO.
Management Agent
175 West Jackson Boulevard
Chicago 4
Telephone WAbash 2-0756

QUILTY ENGINEERING CO.
CONSTRUCTION ENGINEERS

Standardized
Structural Steel
for Modern
Industrial Buildings

Rigid Frame Units
Bridge Crane Units

NAPERVILLE, ILLINOIS

WM. E. SCHWEITZER & CO.
General Contractors
2207 DODGE AVENUE
EVANSTON, ILLINOIS
AMbassador 2-3489 GReenleaf 5-4414
★ ★ ★
Contractors for Industrial Construction

4606-28 West 12th Place
Chicago 50, Ill.

VENTILATION
THE ZACK CO.
AIR CONDITIONING

BI shop 2-1533-4-5 Town Hall 3-0905

MUNCIE CONSTRUCTION CORP.
Contractors
for
Utility Maintenance
and
Construction
Transmission Lines
Substation
Distribution Systems
Plant Electrical
201½ East Adams Street,
Muncie, Indiana

ROBERT W. HUNT COMPANY
ENGINEERS
Inspection • Tests
Consultation
•
Engineering Materials
•
Cement • Concrete • Chemical
Physical and Metallurgical
Laboratories
175 W. Jackson Blvd., CHICAGO, And All Large Cities

tation purposes; to provide sufficient water for satisfactory navigation from Sioux City to the mouth; and to permit generation of substantial quantities of electrical energy.

I would like at this point to inject a brief description of the Missouri Basin Inter-Agency Committee. There are six federal members and the Governors of the ten basin states represented on the Committee. The present chairman is Mr. Ben Greene of the Federal Power Commission, who incidentally is the only one of the original members now serving on the Committee. It is a voluntary body without legal authority or administrative controls. It is one of the administrative devices now used for coordinating the work of the federal and state agencies. By conducting monthly public metings in the different basin states, those interested are able to probe current problems and also keep abreast of all developments through regular progress reports. Although an unofficial body, it does assert considerable influence in the planning construction and operation of the developments.

A great deal of publicity has been given the development program now underway in the Missouri River Basin. Some of this publicity has been good—some of it has been very critical. Very recently, the President appointed the members of a survey commission to examine the adequacy of plans and economic soundness of the development proposals. This is not the first outside group to look over our shoulder nor do I assume it will be the last. In an undertaking as tremendous as the Missouri Basin development, there is always need for improvement.

Prior to the appointment of this survey commission, we came under the scrutiny of the President's Water Policy Commission and the Hoover Commission. Many private groups and organizations have also examined or leveled criticism at certain phases of the work. Most critical of the present method of operations has been the advocates of an MVA. For those of you interested in an unbiased account of the pros and cons of the MVA, I recommend Richard G. Baumhoff's recent book called the, "Dammed Missouri Valley." Because of the magnitude of the program and diversity of interest involved, the plan will be subjected to continuous scrutiny.

In summarizing resources development in the Missouri River Basin, I believe we are participating in a development era which history will record as a major achievement by mankind in this field. A development program of this magnitude encompasses the interests, and desires of a large segment of our population and is subjected to all the forces at the command of a complicated society. However, I am sure the basic objectives will be achieved.

FOR DEPENDABLE POWER SWITCHING EQUIPMENT—SPECIFY DELTA-STAR

- Outdoor Substations
- Air Switches
- Disconnect Switches
- Interrupter Switches
- Bus Structures
- Bus Supports
- Power Connectors
- Terminators (Potheads)
- Crane Rail Supports
- Cable Supports
- Plugs and Receptacles

Engineers prefer Delta-Star products for their high standard of quality. Complete lines of equipment are available for both indoor and outdoor service.

DELTA-STAR ELECTRIC COMPANY
DIVISION OF H. K. PORTER COMPANY, INC.
MAIN OFFICE AND FACTORY 2400 Block, Fulton St. Chicago 12, Ill.

Reinforced Plastic New Structural Material

Reinforced plastics are fast becoming competitors of steel, aluminum and wood and may well turn out to be the most important new structural materials developed during the past decade, according to an article in *Chemical Week.*

The Armed Forces are buying substantial amounts for more than 125 uses, the article reports. For reinforced plastic pipe alone, they are expected to use 10 million pounds of plastics a year.

The Navy is ordering use of some plastics regardless of the availability of steel, copper or other metals and does not consider them substitutes.

To make these plastics, reinforcing materials such as fibrous glass, cotton, rayon, nylon and paper are embedded in plastic resin, which is then molded to shape and allowed to harden, the magazine explains.

This combination of plastic and reinforcement makes a versatile structural material. The plastic is weather-resistant, easily colored and molded. The reinforcement adds strength, toughness and dimensional stability.

Civilian products made from reinforced plastics are as varied as those being discovered by the military, according to the magazine. Refrigerator manufacturers use it for parts because it is corrosion- and rust-resistant and conducts very little heat; the plastics are used for fishing rods because their flexibility and rigidity can be varied in exact degrees. Other uses include dent-resistant tanks for chemicals and acids, safety helmets for industrial workers, skiis, chairs and even coffins.

Plastic Engineers Announce Contest

"Mr. J. H. DuBois, Vice-President, Engineering, Mycalex Corporation of America, is chairman of the Annual National SPE Prize Paper Contest," so announced Mr. William O. Bracken, Hercules Powder Company, President of the Society of Plastics Engineers, Inc.

The contest is sponsored each year by the Society to encourage plastics technicians to prepare technical papers on various phases of the plastics industry.

"Mr. DuBois originated the SPE Prize Paper Contest while he was president of the Society in 1948. So, it is appropriate that he should be directing the contest during its fifth year," continued Mr. Bracken.

Besides prizes offered by the local sections of the Society, the national prizes are $200.00, $100.00, $50.00, and the presentation of the papers by the authors at the Annual Technical Con-

E. R. GRITSCHKE
and
ASSOCIATES
Consulting Engineers
Designers of
MECHANICAL and ELECTRICAL SYSTEMS
for BUILDINGS
11 S. LaSalle St., Chicago 3, Ill.

Battey & Childs
ENGINEERS — ARCHITECTS
231 So. LaSalle Street
Chicago 4, Ill.
INDUSTRIAL PLANTS
POWER PLANTS
RAILROAD SHOPS & TERMINALS
DESIGN **SUPERVISION**

WADEFORD ELECTRIC COMPANY
ESTABLISHED 1887
•
Electrical Contractors and Engineers
•
205 W. Wacker Drive • Chicago 6, Illinois
FRanklin 2-1091

THE MONADNOCK
53 West Jackson Blvd.
LONG RECOGNIZED AS
Headquarters for Office Space
FOR
Engineers
Architects
Patent Attorneys
Manufacturers' Representatives
ALDIS & COMPANY *Management*
The Whole Loop at its Doorstep

Charles B. Burdick Louis R. Howson
Donald H. Maxwell

Alvord, Burdick & Howson

ENGINEERS FOR

Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation

20 N. Wacker Drive · Chicago 6

Telephone: CE ntral 6—9147

Building since 1893

S. N. NIELSEN COMPANY

General Contractors

CHICAGO 22

SARGENT & LUNDY

ENGINEERS

140 S. DEARBORN STREET

CHICAGO, ILLINOIS

FULTON ASPHALT CO.

"Since 1870"

ASPHALT MASTIC FLOORS
ACID PROOF MASTIC FLOORS
INDUSTRIAL COMPOSITION FLOORS
HASTINGS COMPRESSED ASPHALT
BLOCK FLOORS

165 W. Wacker Dr., Chicago 1

RA ndolph 6—1760

**Freyn Engineering Dept.
Koppers Co., Inc.**

Established 1914
CONSULTING ENGINEERS
for
Blast Furnaces—Steel Works—
Industrial Plants
Industrial Power Generation and Use

Technical and Financial Reports
Surveys—Appraisals
Designs and Supervision of Construction
109 North Wabash Avenue
CHICAGO 2

ference at the Hotel Statler, Boston, Massachusetts, January 21-23, 1953.

The judges assisting Mr. DuBois in the contest are: A. J. Warner, Technical Director of Chemical and Physical Laboratories, Federal Tele-communication Laboratories, Inc.; Frank Reinhart, Assistant Chief of Organic Plastics Section, National Bureau of Standards; R. L. Whann, Plastics Engineer, North American Aviation, Inc.; and Carmen R. Giannotta, Supervisor of Plastics Laboratory, Eastman Kodak Company.

Complete contest rules will be furnished by the Society of Plastics Engineers, Inc., 409 Security Bank Building, Athens, Ohio.

Carl Franks Named to New Position at PCA

Carl D. Franks, Vice President for Promotion of the Portland Cement Association since 1948, has been appointed to the newly created position of Executive Vice President, according to an announcement issued by Smith W. Storey, Chairman of the Board of Directors of the Association.

As Executive Vice President, Mr. Franks' responsibilities will include exercising the duties of the President of the Association in that official's absence. He will also have such other duties as may be assigned to him by the President or the Board of Directors. The position of PCA President was left vacant by the death of Frank T. Sheets last November, and has not yet been filled.

Mr. Franks has been a member of the staff of the PCA since it was established with its main offices in Chicago in 1916. His first position was that of District Engineer in charge of the Indianapolis Office. After eight years of service in this post, he was appointed in 1924 to the position of Midwestern Regional Manager, directing the activities of seven of the Association's district offices. In 1948 he became Vice President for Promotion, and for the past four years has supervised the promotive activities of the Association, including the work of 26 district offices serving cement users in 45 states, the District of Columbia and British Columbia.

Golf Dates Set by Architects Club

Members of WSE have been cordially invited to join the Architects Club of Chicago for a series of golf tournaments to be held at various courses in the Chicago area. Schedule for this summer is:

August 7	Brookwood
August 29	River Forest
September 18	Midlothian Country Club
October 2	River Forest

WSE members wishing to join the architects on any or all of the dates shown should make their reservations with Elmer Fox at WA bash 2-1507.

FEDERAL PIPE & SUPPLY CO.

900 S. CAMPBELL AVE.

CHICAGO 12, ILL.

PIPE — VALVES — FITTINGS

PIPE FABRICATION

SEELEY 3-6960

Engineering Societies Personnel Service, Inc.

New York Chicago Detroit San Francisco

84 East Randolph St., Chicago 1, Ill., ST ate 2-2748

These items are from information furnished by the Engineering Societies Personnel Service, Inc., Chicago. This SERVICE, operated on a co-operative, non-profit basis, is sponsored by the Western Society of Engineers and the national societies of Civil, Electrical, Mechanical and Mining and Metallurgical Engineers. Apply to ESPS, Chicago and the key number indicated. Prepared ENGINEERS AVAILABLE advertisements limited to 40 words, with typed resume attached may be submitted to ESPS Chicago by members of Western Society of Engineers at no charge.

"OVER THE MANAGER'S DESK"

Many employers seem to think that the shortage of engineers is a temporary condition which will be overcome in about a year. The truth of the matter is that this condition will be with us until 1960 and all forecasts indicate it will be much worse before it gets better.

Many engineers think this is a good time to take advantage of the situation. Actually this is not the case. It is true that this period does and will offer an engineer the opportunity to better himself as long as he stays within reason as to salary requirements compared to what he can offer in knowledge and experience.

If in doubt either as an employer or as an employee, contact E. S. P. S. and let us give you the benefit of our experience. —B. H. A.

POSITIONS AVAILABLE

R-8989 PRODUCT DEVELOPMENT. ME. or EE Up to 40. 3 yrs. plus exp. in engineering and administration work in area of precision or intricate mechanisms. Should be creative thinker. Duties: research and development to improve products. Both engineering and administrative duties. For manufacturers of dental electric and aircraft equipment. Employer may negotiate the fee. Salary: $15,000-$20,000. Location: Upper New York State.

T-8993 MATERIAL HANDLING ENGINEER ME or IE. Age: up to 35. 2 plus years exp. in material handling on cased goods. Knowledge of lift truck operations and plant layout. Duties: set up systems for use of lift trucks. For a brewery. Salary: $500-$600 per month. Employer will pay fee. Location: Wisconsin.

R-8991 DESIGN—Bridges, EE. 5 plus years exp. in steel and concrete design. Knowledge of bridge design, particularly steel desirable. Duties: designing and drawing up own work. For a consultant. Salary $500-$525 per month. Employer will pay fee. Location: Chicago.

R-8990 DESIGNER. CE. Able to do board work on roads, paving, curbs and gutters, storm drains and railroads. Duties: Design on the board on above named type of projects. For a consulting firm. Salary: $400-$700 per month. Employer may negotiate fee. Location: Chicago.

R-8988 RECENT GRADUATE—Mechanical. Age: about 23. Duties: working in office as sales trainee for manufacturer of aluminum sheet products. Must have good personality. Salary to $350. Location: Chicago.

T-8987 INSTRUCTOR Mechanical Drawing M.S. Degree. Age to 35. Duties: teaching engineering drawing first year —but should be able to handle other courses in mechanical engineering. Salary to $3,800 for school terms. Location: No. Michigan.

T-8986 (b) DESIGN ENGINEER, Prefer BS Degree. Age: 23-40. 3 yrs. exp. product development in electro-mechanical field. Knowledge of electronics or acoustics useful. Duties: development of electrically controlled mechanisms and electro-mech. components for mass production including preparation of engrg. information which will permit smooth mfg. flow and insure good field performance of products. Some electronic and acoustic work would be available were applicant so trained. For a manufacturer of automatic phonographs and allied equipment. Salary: $5000-$8500. Employer will negotiate fee. Travel on rare occasions.

T-8986 (a) INSPECTION ENGINEER, BSEE (preferred). 28-35 years of age. 3 years exp. in manufacturing of electrical products, associated with inspection, processing or at testing. Supervisory experience desirable. Knowledge of electronics manufacturing. Duties: administrative work consisting of organizing and supervising quality control and inspection covering fabrication and assembly including design and maintenance of electrical and mechanical testing equipment. For mfgr. of coin operated phonograph (jukebox) Company neg. fee. Salary: $5000-$7200. Location: Michigan.

If placed in a position as a result of an Engineers Available or Position Available advertisement, applicants agree to pay the established placement fee. These rates are available on request and are sufficient to maintain an effective non-profit personnel service. A weekly bulletin of positions open is available to subscribers. Apply ESPS Chicago.

ENGINEERS AVAILABLE

CHIEF ENG. M.E. 43. Three yrs. and nine mos. Project Engr., making power plant surveys, write reports and specifications, evaluate bids, make recommendations for purchase, take charge of design of plant, equipment layout, piping and client relations. Ten and one half yrs. District Manager, ass't field erector and operator, layout of stoker installations, estimator, manage subsidiary company in development, design and application of grinding machine. Time and motion study, abrasive devel. Six yrs. and three mos. Foundation Inspector, preliminary surveys, survey party leader, layout of foundations, wall tracks. $10,000. Midwest. 373 MW.

ESTIMATOR CE 38. Eight and one half yrs., Project Engineer, steel design, estimating, field erection trouble shooting on power house construction, field erection contacts, concrete design, structural steel detailing, layout, field engineer on steel erection, customer contacts, and some concrete design. Three yrs. Surveyor, heading field parties of 2 to 4 men, instrument man, survey plats, maps, legal descriptions. Chicago. $7,000. 374 MW.

GENERAL MANAGER ME 30. Seven yrs. and nine mos. Design Engr. research, development, testing of high speed coal pulverizer, design of special machinery and production dept. To produce special parts for coal pulverizer, field work. Supervisor of gauge and fixture design, hydraulic valve, dies, trimmers, presses, tool, maintenance parts, design of forging equipment. $7,500. Midwest. 375 MW.

STATISTICIAN or QUAL. CONT. Math Stat. 35. Sixteen mos. Qual. Cont. Eng., set up and maintain qual. cont. system. Insp. procedures, records forms, sampling plans, control charts, precision inspection. Two and one half yrs. taught math, stat. qual. cont. Three yrs. and three mos., install, maintain, airbourne radio equipment. Chicago. $6,000. 378 MW.

VERN E. ALDEN COMPANY

ENGINEERS

33 N. LaSalle Street

Engineering Investigation
Engineering Design

DE LEUW, CATHER & COMPANY

Consulting Engineers

Transportation, Public Transit and Traffic Problems

Industrial Plants	Grade Separations
Railroads	Expressways
Subways	Tunnels
Power Plants	Municipal Works

150 N. WACKER DRIVE, CHICAGO 6, ILL.

GREELEY AND HANSEN

ENGINEERS

Samuel A. Greeley	Kenneth V. Hill
Paul E. Langdon	Samuel M. Clarke
Thomas M. Niles	Paul Hansen (1920-1944)

Water Supply, Water Purification
Sewerage, Sewage Treatment
Flood Control, Drainage, Refuse Disposal
220 S. STATE STREET, CHICAGO 4

THE
HAINES
COMPANY

Ventilation &
Air Conditioning Contractors
Sheet Metal Fabricators
— Welding —

1931 WEST LAKE STREET
CHICAGO 12, ILLINOIS
SEeley 3—2765

MAX M. SALZMAN

Consulting Engineer

SPECIALIST IN INDUSTRIAL BUILDINGS
DESIGN AND SUPERVISION
POWER PLANTS
BUILDING INSPECTIONS
APPRAISALS

53 W. Jackson Blvd. Chicago 4

Index of MIDWEST ENGINEER *Advertisers*

—CUSTOM BUILT—

To Your Specifications

•

Switchboards	**Distribution Panels**
Benchboards	**Motor Control Centers**
Panelboards	**Junction Boxes**
Steel Cabinets	**Raceways**

Sheet Metal and Light Structural Fabrication
Busducts

•

GUS BERTHOLD ELECTRIC CO.
1716 W. HUBBARD ST.
CHICAGO 22, ILL.
CHesapeake 3-5767

The L. E. Myers Co.

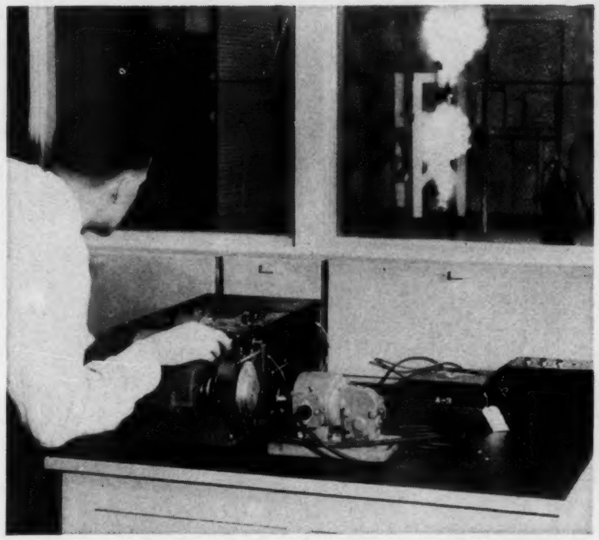
ESTABLISHED 1891

•

Construction of Public Utilities

•

53 West Jackson Boulevard
Chicago 4, Illinois



Research in L-M's short circuit laboratory—"KNOW-HOUSE." Non-destructive testing of L-M products is performed in open test areas. To the right of the fuse cutout here under test is located a reinforced steel and concrete test cell for testing to destruction. Photography, high-speed motion pictures and magnetic and cathode ray oscillograms play an important part in both types of testing.

L-M RESEARCH
is the basis for
L-M PROGRESS

Line Material makes research an important part of its program, because upon research is based the continuous development of new and better products.

This is a principle that we *practice*, as indicated by the number of L-M laboratories. There are, for example, two photometric laboratories, two high-voltage surge laboratories, a fuse laboratory, three high-potential and radio test laboratories, four mechanical and general laboratories, a short circuit laboratory, an oil circuit breaker laboratory, chemical laboratories, and others.

Here, in a creative atmosphere, are developed the many L-M "firsts" in the electrical distribution industry that help the utility companies bring you safe, economical, unfailing electric power. . . . Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

69

LINE MATERIAL
Research and Development

Completely tested and coordinated electrical equipment that brings electric power to home, farm, and factory.

Place Your Plant Where There's Everything-

—PLUS Room to Grow!

THE GREATEST INDUSTRIAL CENTER OF THE UNITED STATES

Chicago and Northern Illinois

AMONG the great assets of the country are the industrial facilities of the Chicago and Northern Illinois area.

Industrial growth in the Chicago area during recent years, measured in dollars, has exceeded that of any other comparable area in the United States.

Add to its natural advantages the tremendous resources that this area has developed for itself—transportation, marketing, research, education, fine cultural and living facilities—and you have reasons why the Chicago and Northern Illinois area has come to be the greatest industrial center of the United States.

A LETTER TO US . . . *describing your requirements will bring you a careful analysis of this area's advantages as they apply to your business. Or if you wish, we will send you a carefully screened list of the available buildings or sites that would be suitable for your operations, based on the information you give us.*

We keep all such inquiries confidential. Just write us.

Industries in the Chicago area have these outstanding advantages: *Railroad Center of the United States • World Airport • Inland Waterways • Geographical Center of U. S. Population • Great Financial Center • The "Great Central Market" • Food Producing and Processing Center • Leader in Iron and Steel Manufacturing • Good Labor Relations Record • 3,062,000 Kilowatts of Power • Tremendous Coal Reserves • Good Government • Good Living • Good Services for Local Tax Dollars.*

COMMONWEALTH EDISON COMPANY • PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS

TERRITORIAL INFORMATION DEPARTMENT

Marquette Building—140 South Dearborn Street, Chicago 3, Illinois